

# Ecological site R040XA125AZ Sandy Bottom, Woodland 10"-13" p.z.

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#### **General information**

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

#### **MLRA** notes

Major Land Resource Area (MLRA): 040X–Sonoran Basin and Range

Major Land Resource Area (MLRA) 40 is the portion of Sonoran Desert that extends from northwest Mexico into southwestern Arizona and southeastern California. This MLRA is hot desert characterized by bimodal precipitation coupled with hot summers and mild winters. These conditions give rise to a rich biological diversity visually dominated by columnar cactus (saguaro) and leguminous trees (palo verde). This unit occurs within the Basin and Range Physiographic Province and is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges, and basin sediments are combinations of fluvial, lacustrine, colluvial and alluvial deposits.

#### LRU notes

Land Resource Unit (LRU) 40-1, Upper Sonoran Desert, is characterized by desert scrub vegetation with no desert pavement present. Trees grow on uplands as well as in washes and on hillslopes. Elevations range from 2000 to 3800 feet, and precipitation averages 10 to 13 inches per year. Vegetation includes saguaro, palo verde, mesquite, creosotebush, triangle bursage, prickly pear, cholla, limberbush, wolfberry, bush muhly, threeawns, ocotillo, and globe mallow. The soil temperature regime is thermic and the soil moisture regime is typic aridic.

#### **Classification relationships**

USDA-NRCS Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin: Western Range and Irrigated Region D Major Land Resource Area 40 - Sonoran Basin and Range Land Resource Unit 1 - Upper Sonoran Desert Ecological Site Sandy Bottom, Woodland, 10"-13" p.z.

U.S. Environmental Protection Agency, Ecological Regions of North America: Level I, Region 10 North American Deserts Level II, 10.2 Warm Deserts Level III, Ecoregion 81, Sonoran Basin and Range Level IV, 81I, 81n, 81o

USDA-USFS Ecological Subregions: Sections of the Conterminous United States Section 322 American Semidesert and Desert Province Section 322B, Sonoran Desert

#### **Ecological site concept**

Sandy Bottom, Woodland, 10"–13" p.z. occurs on a bottom position, receiving both rainfall and run-on moisture. The shallow water table fluctuates in depth but is available to the plant community year-round. Soils have visible redoximorphic features with 80" of surface. Reference plant community is dominated by tall trees with a diverse understory. Obligate and facultative wetland plants occur along reaches of surface or near surface water flow. Aspect is a gallery woodland.

#### **Associated sites**

R040XA124AZ	Loamy Bottom, Woodland 10"-13" p.z. adjacent stream terraces, no soil redox features
R040XA115AZ	Sandy Wash 10"-13" p.z. stream channel with ephemeral water flows, no soil redox features

## Similar sites

F040XB215AZ	Sandy Bottom, Woodland 7" - 10" p.z. Elevations 1,200' to 2,000'	
F040XC327AZ	Sandy Bottom, Woodland 3"-7" p.z. Elevations 300' to 1,200'	

#### Table 1. Dominant plant species

Tree	(1) Populus fremontii (2) Salix gooddingii	
Shrub	Not specified	
Herbaceous	(1) Sporobolus wrightii	

## **Physiographic features**

This site occurs on floodplains, low stream terraces and in channels of major drainageways and first and second order tributaries. The site experiences regular overbank flood events, and has a shallow water table, ranging from 3 to 10 feet in depth. Slopes range from 0% to 2%, and elevations range from 2200 to 3600 feet.

#### Table 2. Representative physiographic features

Landforms	<ul><li>(1) Flood plain</li><li>(2) Stream terrace</li><li>(3) Channel</li></ul>
Elevation	671–1,097 m
Slope	0–2%

## **Climatic features**

Annual precipitation ranges from 10 to 13 inches in the southern part of this LRU, with elevations between 1900 and 3200 feet. Annual precipitation in the northern part ranges from 11 to 14 inches, with elevations between 2000 and 3800 feet. Rainfall ratios range from 40:60 (winter:summer) in the southern part, 50:50 in the central portion, and 60:40 in the northern part.

Overall, average annual rainfall is variable, but increases in variability from east to west across the region. For long-term precipitation data, the coefficient of variation, the ratio of the standard deviation to the mean expressed as a percentage, increases from 29% at Tucson (east) to 36% at Carefree (west).

Rainfall intensity differs between rainfall seasons. Winter frontal storms develop in the Pacific Ocean and Gulf of California, producing widespread, low-intensity and long duration precipitation events. Snowfall is rare and seldom last for more than a few hours. During summer months (July-September), atmospheric activity in the Gulf of Mexico produces convective thunderstorms of short duration, usually less than 30 minutes, but of moderate to heavy intensity. May and June are the driest months of the year. Humidity is generally very low.

Winter temperatures are mild, with only a few days of freezing temperatures overnight. Summer temperatures are warm to hot, with several days in June and July exceeding 105°F.

Spring and the summer growing seasons are equally important for perennial grass, forb and shrub growth. With above average precipitation, cool and warm season annual forbs and grasses can be common in their respective seasons. Perennial forage species can remain green throughout the year with sufficient available moisture.

# Influencing water features

## **Soil features**

These are very young soils on sandy and gravelly alluvium of mixed origin. Soils are deep and have excellent plantsoil moisture relationships due to shallow water tables.

Surface texture	<ul><li>(1) Gravelly sandy loam</li><li>(2) Loamy fine sand</li><li>(3) Fine sandy loam</li></ul>
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to well drained
Permeability class	Rapid to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	6.35–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0–3%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–65%
Subsurface fragment volume >3" (Depth not specified)	0–20%

## **Ecological dynamics**

Sandy Bottom, Woodland, 10-13" p.z. is a gallery woodland associated with large perennial water courses. Dominated by cottonwood and willow, the site is vulnerable to invasion from saltcedar.

# State and transition model

40-1 Sandy Bottom, woodland 10- 13" p.z. (R040XA125AZ) - DRAFT



Figure 1. Sandy Bottom, Woodland STM

## Transition Pathways

T1A. Water-table depleted by groundwater pumping to greater than 20 feet. Mature trees die back to a reduced canopy that periodic flooding can support. Bank erosion widens channel area and wetland grasses and forbs are replaced by annuals. HYMO and BASA colonize areas of river-wash. No return, if pumping is associated with urban areas or development.

T1B, T2A, T5A. Introduction of a seed source for salt cedar. As fires, age and floods remove POFR and SAGO, salt cedar increases to assume dominance. As salt cedar canopy closes to 80%, the under-story vegetation is reduced to zero.

T1C. CHG. Mature POFR and SAGO die from age, fire or flood. Reproduction of POFR and SAGO is heavily grazed and little recruitment occurs. BASA and HYMO dominate the stream bank vegetation; bermuda, Johnson grass and exotic annuals dominate the under-story vegetation.

#### **Restoration Pathways**

R2A. Cessation of groundwater pumping may allow water tables to rise over time to within 20 feet of the surface. Time depends on depth of depletion and amount of pumping reduced. This will not occur in urban or developing areas unless treated sewage effluent is discharged into the stream system. R4A. Unknown, possible herbicide control of salt cedar and replanting of POFR and SAGO from dormant poles on limited acres. Biological control of salt cedar may be possible using a leaf beetle from China called Diorhabda elongata.

R5A. PG/NG will result in return to POFR and SAGO dominance in less than 20 years. Trees will reach maturity in 50-70 years. Native perennial grasses and wetland forbs replace bermuda.

Figure 2. Sandy bottom, woodland, 10-13" p.z. STM Legend

# State 1 Gallery Woodland, Native State

# Community 1.1 Mature Tree Community (Reference)

Cottonwood and willow dominated, with 40%-80% canopy cover, with an understory of perennial grasses, sedges, rushes, and wetland forbs.

#### Table 4. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	841	-	1261
Total	841	-	1261

# **Immature Tree Community**

Cottonwood and willow occupy between 20%-40% of the canopy cover, with tree saplings occupying 10%-50% of the canopy. Understory of tall grasses, sedges, rushes and wetland forbs. Flood or fire reduce mature tree cover.

# State 2 Riverwash State

Wide channel, with no streamflow and a lowered water table. Active gully and streambank erosion processes. Native annuals occur on riverwash sands in response to rainfall.

# Community 2.1 Riverwash Shrubland Community

Cottonwood and willow occupy 5%-10% of the canopy, with burrobrush and seepwillow also occupying 5%-10% of the canopy.

# State 3 Non-Native Woodland State

Cottonwood and willow cover eliminated by flood or fire. Saltcedar rapidly colonizes and achieves up to 80% cover. Understory cover reduced to near zero.

# Community 3.1 Salt Cedar Community

Saltcedar occupies from 10%-80% of the canopy. As saltcedar canopy increases, understory decreases or is eliminated.

## State 4 Native Tree-Shrub State

Mature cottonwood and willow slowly die out, and saplings remain stunted due to grazing pressure. Seepwillow and burrobrush dominate streambanks.

# Community 4.1 Seepwillow Community

Seepwillow and burrobrush dominate streambanks.

# Transition T1A State 1 to 2

Water table is lowered to a depth of greater than 20' by groundwater pumping. Mature trees die back to a level supported by periodic flooding.

Constraints to recovery. Site cannot recover without elimination of groundwater pumping.

Transition T1B State 1 to 3

Saltcedar introduction.

# Transition T1C State 1 to 4

Continuous heavy grazing suppresses cottonwood and willow seedling maturation. Old trees die-out.

# Restoration pathway R2A State 2 to 1

Cessation of pumping may permit groundwater level to rise with time.

## Transition T2A State 2 to 3

Saltcedar introduction.

# Restoration pathway R3A State 3 to 1

Unknown.

# Restoration pathway R4A State 4 to 1

Unknown.

#### Transition T4A State 4 to 3

Saltcedar introduction.

# Additional community tables

#### Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				158–211	
	saltgrass	DISP	Distichlis spicata	158–211	-
	knotgrass	PADI6	Paspalum distichum	158–211	-
	vine mesquite	PAOB	Panicum obtusum	158–211	-
2				53–105	
	Havard's threeawn	ARHA3	Aristida havardii	53–105	-
	spidergrass	ARTE3	Aristida ternipes	53–105	-
	cane bluestem	BOBA3	Bothriochloa barbinodis	53–105	-
	sideoats grama	BOCU	Bouteloua curtipendula	53–105	-
	Arizona cottontop	DICA8	Digitaria californica	53–105	-
	squirreltail	ELELE	Elymus elymoides ssp. elymoides	53–105	-
	green sprangletop	LEDU	Leptochloa dubia	53–105	_
	rice cutgrass	LEOR	Leersia oryzoides	53–105	-
	mat muhly	MURI	Muhlenbergia richardsonis	53–105	-
	whiplash pappusgrass	PAVA2	Pappophorum vaginatum	53–105	_
	plains bristlegrass	SEVU2	Setaria vulpiseta	53–105	-
	spike dropseed	SPCO4	Sporobolus contractus	53–105	-
	sand dropseed	SPCR	Sporobolus cryptandrus	53–105	-
	mesa dropseed	SPFL2	Sporobolus flexuosus	53–105	-
	big sacaton	SPWR2	Sporobolus wrightii	53–105	_

3				53–105	
	sedge	CAREX	Carex	53–105	_
	flatsedge	CYPER	Cyperus	53–105	-
	rush	JUNCU	Juncus	53–105	_
4		-	·	11–105	
	prairie threeawn	AROL	Aristida oligantha	11–105	-
	Rothrock's grama	BORO2	Bouteloua rothrockii	11–105	-
	Arizona brome	BRAR4	Bromus arizonicus	11–105	-
	brome	BROMU	Bromus	11–105	-
	feather fingergrass	CHVI4	Chloris virgata	11–105	-
	canyon cupgrass	ERLE7	Eriochloa lemmonii	11–105	-
	pitscale grass	HAGR3	Hackelochloa granularis	11–105	-
	bearded sprangletop	LEFUF	Leptochloa fusca ssp. fascicularis	11–105	-
	Mexican sprangletop	LEFUU	Leptochloa fusca ssp. uninervia	11–105	-
	mucronate sprangeltop	LEPAB	Leptochloa panicea ssp. brachiata	11–105	-
	delicate muhly	MUFR	Muhlenbergia fragilis	11–105	-
	witchgrass	PACA6	Panicum capillare	11–105	-
	Arizona signalgrass	URAR	Urochloa arizonica	11–105	-
Forb		-			
5				28–140	
	bigseed alfalfa dodder	CUIN	Cuscuta indecora	28–140	_
	mesquite mistletoe	PHCA8	Phoradendron californicum	28–140	_
	oak mistletoe	PHLE14	Phoradendron leucarpum	28–140	_

# **Animal community**

Grazing pressure should be managed to allow for periodic reproduction of Fremont cottonwood and Godding's willow. Cottonwood and willow seeds will germinate on fresh alluvium deposited by spring or summer floods. Seedlings require one full season to outgrow the reach of grazing livestock. Summer seedlings may require two seasons to reach a height where the terminal bud is out of reach. Seedlings of both species are very palatable to cattle.

# Wood products

High water tables and very erodible soils limit wood production on this site. The wildlife habitat value of the site is many times greater than the value for any commercial wood products. Wood removal and cutting should be limited to flood damaged and fallen trees and driftwood.

# **Type locality**

Location 1: Maricopa County, AZ					
Township/Range/Section T7N R4W S20					
General legal description Phoenix FO - Hassayampa River Preserve - Nature Conservancy					
Location 2: Pima County, AZ					
Township/Range/Section T16S R17E S29					
General legal description Tucson FO - Cienaga Creek - Pima County Property					
Location 3: Gila County, AZ					

Township/Range/Section	T4S R17E S34			
General legal description	San Carlos FO - Mineral Strip, Deer Creek			
Location 4: Pima County, AZ				
Township/Range/Section	T6S R16E S17			
General legal description	Tucson FO - San Pedro River between Dudleyville and Winkleman - NW 1/4 Sec.17			

# **Other references**

Griffith, G.E., Omernik, J.M., Johnson, C.B., and Turner, D.S., 2014, Ecoregions of Arizona (poster): U.S. Geological Survey Open-File Report 2014-1141, with map, scale 1:1,325,000, https://dx.doi.org/10.3133/ofr20141141. ISSN 2331-1258 (online)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

## Contributors

Dan Robinett, original author Wilma J Renken, revisions

# Approval

Kendra Moseley, 10/17/2024

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/13/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

#### Indicators

- 1. Number and extent of rills:
- 2. Presence of water flow patterns:
- 3. Number and height of erosional pedestals or terracettes:

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):
- 5. Number of gullies and erosion associated with gullies:
- 6. Extent of wind scoured, blowouts and/or depositional areas:
- 7. Amount of litter movement (describe size and distance expected to travel):
- 8. Soil surface (top few mm) resistance to erosion (stability values are averages most sites will show a range of values):
- 9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):
- 10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:
- 11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):
- 12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

- 13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):
- 14. Average percent litter cover (%) and depth ( in):
- 15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annualproduction):

- 16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:
- 17. Perennial plant reproductive capability: